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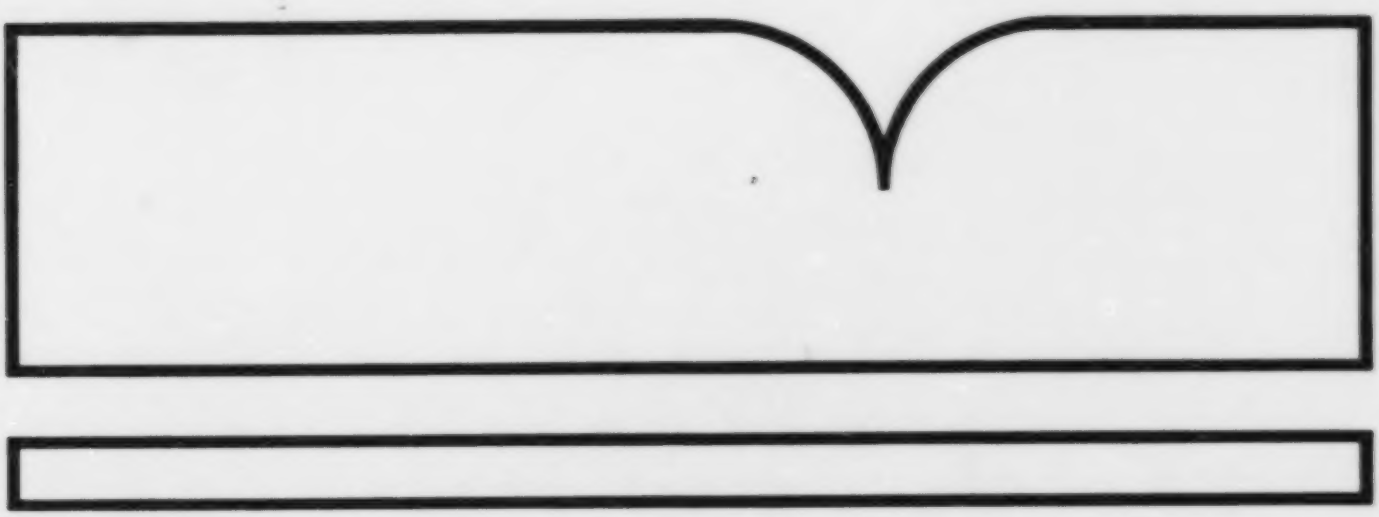
Proposed Sludge Management Program for the Los Angeles/Orange County Metropolitan Area

Los Angeles-Orange County Metropolitan Area Project, Whittier, CA

Prepared for

Environmental Protection Agency
San Francisco, CA

Apr 80



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This Summary of the Draft Environmental Impact Statement/Environmental Impact Report (DEIS/DEIR) and Facilities Plan evaluates the Proposed Sludge Management Program for the Los Angeles/Orange County Metropolitan Area. The Proposed Program was designed for environmentally, socially and economically cost-effective recovery of resources from wastewater sludges and reliable management of wastewater sludge to minimize the public health risks and environmental degradation. The Proposed Program is divided into three separate entities, which would provide for sludge management in the Los Angeles County Sanitation Districts, Orange County Sanitation Districts, and the City of Los Angeles.

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PROPOSED SLUDGE MANAGEMENT PROGRAM FOR THE LOS ANGELES/ORANGE COUNTY METROPOLITAN AREA

EIS/EIR DRAFT

ENVIRONMENTAL IMPACT STATEMENT
ENVIRONMENTAL IMPACT REPORT

LA/OMA PROJECT

EPA United States Environmental Protection Agency

Region IX
215 Fremont St.
San Francisco, Ca. 94105

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Analysis of ocean disposal systems, other than for the NEPA-CEQA No Project Alternative was not studied using EPA and SWRCB funds. Funding for deep ocean outfalls and barge disposal was provided by the Los Angeles County Sanitation Districts, Orange County Sanitation Districts, and City of Los Angeles.

To whom it may concern:

This summary is a reproduction of the executive summary from the Draft EIS/EIR. This purpose of this document is to provide a brief discussion of the assessment of management alternatives and the consequences of the proposed wastewater sludge management program.

A full report, "Proposed Sludge Management Program for the Los Angeles/Orange County Metropolitan Area Draft Environmental Impact Statement/Report" discusses in detail the development of the wastewater sludge management facilities proposed for each agency to accomodate sludge loads projected to the year 2000. Policy actions, continuing research needs, and implementation schedules are also specified. This document is available for public review and comment at any library on the following list.

Comments on this document or the full draft EIS/EIR should be submitted by July 21, 1980 to:

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PROPOSED SLUDGE MANAGEMENT PROGRAM FOR THE LOS ANGELES/ ORANGE COUNTY METROPOLITAN AREA
* * CALIFORNIA * *

SUMMARY
DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT AND FACILITIES PLAN

PARTICIPATING AGENCIES AND CONTACT PERSONS

LOS ANGELES COUNTY SANITATION DISTRICTS	ORANGE COUNTY SANITATION DISTRICTS	CITY OF LOS ANGELES	CALIFORNIA STATE WATER RESOURCES CONTROL BOARD	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (LEAD AGENCY)
Robert Miele (213) 699-7411	Ray Lewis (714) 962-2411	Robert Horii (213) 485-3845	Betty Meyer (916) 322-6653	Ann Godfrey (415) 556-8037

For further information regarding this document, please contact the above listed members of the LA/OMA Project Staff Review Committee or Bill Davis, at LA/OMA Project: P.O. Box 4998, Whittier, California 90607; or call (213) 699-7411.

ABSTRACT

This Summary of the Draft Environmental Impact Statement/Environmental Impact Report (DEIS/DEIR) and Facilities Plan evaluates the Proposed Sludge Management Program for the Los Angeles/Orange County Metropolitan Area. The Proposed Program was designed for environmentally, socially and economically cost-effective recovery of resources from wastewater sludges and reliable management of wastewater sludge to minimize the public health risks and environmental degradation. The Proposed Program is divided into three separate entities, which would provide for sludge management in the Los Angeles County Sanitation Districts, Orange County Sanitation Districts, and the City of Los Angeles. A minimum of 75 percent Federal Funding is expected. The remaining funding will be provided by State (12½ percent) and local sources. Comments on the full DEIS/DEIR and Facilities Plan will be accepted until July 21, 1980 at:

LA/OMA PROJECT
P.O. Box 4998
1955 Workman Mill Road
Whittier, Calif. 90607

OR

U.S. ENVIRONMENTAL PROTECTION AGENCY
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215 Fremont Street
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SUMMARY OF DRAFT EIS/EIR

Sewage sludge is an inescapable consequence of a large urban society served by centralized wastewater treatment facilities. People and industries depend upon the wastewater system to remove sewage wastes from their immediate presence and to provide proper treatment for safe disposal in the environment. Sludge is a byproduct of meeting this need -- the cleaner the water, the more sludge is created.

Sewage contains solid particles, most of which are removed by wastewater treatment. Sludge is the broad term for the semi-solid mass formed from these particles during wastewater treatment. Undigested (raw) sludge contains more than 95 percent water, has an offensive odor, does not dewater readily, and has a high concentration of bacteria. Solid matter in sludge is mostly biodegradable organic material such as proteins, carbohydrates, fats, oils, and greases. However, other substances, such as heavy metals and trace organics may also be present, especially in large urban systems.

PURPOSE AND NEED

Sludge management in the Los Angeles/Orange County Metropolitan Area (LA/OMA) is the responsibility of the City of Los Angeles (CLA), County Sanitation Districts of Los Angeles County (LACSD), and County Sanitation Districts of Orange County (OCSD). Two types of sludges must be managed by the operating agencies. Primary sludges are produced by quiescent settling of heavy solid particulates during primary treatment. Sludges produced by secondary treatment (activated sludge process) are biological in nature. Of the two types, secondary sludges are more difficult to manage principally because of poor moisture removal (dewatering) characteristics. In all, the LA/OMA area accounts for about half of all the sludge produced in the state of California.

The Federal Water Pollution Control Act requires secondary treatment of wastewater prior to discharge to surface waters. The Act provides, however, for waiver of such requirements for marine discharges upon compliance with certain specified criteria. Each of the LA/OMA operating agencies is operating or has under construction facilities for partial secondary treatment of wastewaters by the activated sludge process and is awaiting action by EPA on waiver of full secondary treatment requirements.

In the LA/OMA area, substantial commitment has previously been made to use of anaerobic digestion for conversion of about half of the organic matter to digester gas (about 60 percent methane and 40 percent carbon dioxide) and for destruction of all but the very resistant pathogenic organisms. Digestion does not affect water content, hence digested sludge is over 95 percent water and dewatering is required prior to subsequent handling on land. Industrial pretreatment and source control programs are also being used to control discharge of toxic substances to the LA/OMA sewerage systems. It may, however, be necessary to increase such efforts to meet sludge management needs and Federal requirements.

In 1976 (the first year of this study), the LA/OMA operating agencies collectively received and processed about 900 dry tons per day (dtpd) of raw sludge. By year 2000, the amount of raw sludge to be processed is projected to increase by 87 percent if full secondary treatment is provided for all wastewaters. While some of the increase results from population growth, the bulk of the increase results from secondary treatment. Currently, waste activated sludge is being generated by OCSD (approximately 30 dtpd) and by CLA (about 56 dtpd). By 1981, waste activated sludge will also be produced at the Joint Water Pollution Control Plant by LACSD.

In the past, LA/OMA operating agencies have discharged screened, anaerobically digested primary sludge to the Pacific Ocean via submarine outfall systems. The same concern for environmental consequences has led to Federal and State requirements precluding this practice also led to steps taken by LACSD and OCSD to end sludge discharge. Beginning in 1978, LACSD added mechanical dewatering; then, by intensifying their land-based sludge handling operation in 1974, the agency succeeds in digesting, composting, recycling and landfilling 530 dry tons of sludge per day. Similarly, OCSD has been handling their sludge in land-based modes since 1971. Approximately 175 dry tons per day is removed from OCSD effluent. Each of the operating agencies are pursuing interim management programs until the long term plan developed by LA/OMA Project is implemented. Secondary treatment facilities are now coming online and will be used in increasing amounts in the coming years. Increasing amounts of secondary sludges pose potentially severe problems for interim management programs which are being developed by the individual operating agencies. Each of the operating agencies' wastewater treatment plants is located in an urbanized area and concern for nuisance potential is high. Vacant land at the wastewater treatment plants exists in limited amounts and is diminishing as secondary treatment facilities are constructed. These conditions bring about the need for a long term sludge management program. In summary, the sludge must be managed in ways which:

- Comply with the State and Federal prohibition of sludge discharge to the ocean,
- Comply with restrictions imposed by other regulatory agencies for protection of other environmental components,
- Are considerate of the neighborhood and community concerns associated with siting of facilities, and
- Recognize technological uncertainties associated with management alternatives.

Since sludge management costs may amount to as much as half of the operating cost of the wastewater systems, there is a keen financial interest involved. However, solutions must be found which consider not only the jurisdictions served by the wastewater agencies, but also the affected neighborhoods, regulatory requirements, and the public.

PROPOSED SLUDGE MANAGEMENT PROGRAM

The Proposed Sludge Management Program is a logical outgrowth of the analysis and comparative evaluation of alternatives, as well as consideration of the major factors associated with composting, energy recovery, and landfill disposal. Basic to the program is the concept of minimization of environmental, social, economic, and technological risks involved while providing flexibility to respond to changing requirements, current unknowns, and information gained through monitoring of initial performance of planned facilities.

The proposed program for the Los Angeles/Orange County Metropolitan Area consists of individual management programs for each of the three operating agencies.

- Goals and Principles for Sludge Management,
- Conceptual Timeframe,
- Facilities Requirements, and
- Implementation Program.

GOALS

Program goals establish broadly stated policy direction for preparation of the facilities plan and project reports. The goals of the proposed program are:

- Environmentally, socially, and economically cost effective recovery of resources from wastewater sludges, and
- Reliable management of wastewater sludge to minimize public health risks and environmental degradation.

CONCEPTUAL TIMEFRAME

The timeframe for implementation of the proposed sludge management program consists of three phases.

Phase I consists of sludge management planning by the LA/OMA Project and concludes with approval of the facilities plan and environmental documents by the State and EPA.

Phase II consists of design, construction, operation, and monitoring of sludge management facilities to firmly establish performance efficiencies and substantiate economic, environmental, and engineering projections while providing for acceptable management of sludge. Decisions regarding expansion, deletion or replacement of facilities would be made at the conclusion of Phase II or after a reasonable period of operation has provided an adequate basis for such decision. Phase II is anticipated to be concluded within about 10 years after completion of Phase I.

Phase III will consist of actions necessary to carry out decisions reached at the end of Phase II. Planning by the LA/OMA Project has defined currently available options based upon full secondary treatment of all wastewaters. These Phase III options therefore, may also be exercised if full secondary treatment of all wastewaters is required prior to the end of Phase II.

IMPLEMENTATION STRATEGY

The LA/OMA Project Goals Statement adopted in June 1975 calls for development and incorporation of an implementation strategy in the sludge management plan for the Los Angeles/Orange County Metropolitan Area. An implementation program has been developed which describes the actions necessary to carry out the plan, delineates responsibility for such actions, and establishes the time schedule for activities.

The implementation program described addresses completion of Phase I and activities included in Phase II of the sludge management program. Elements of the implementation program are:

- Facilities Planning and Implementation
- Policy Actions
- Research Studies
- Continuing Planning

CITY OF LOS ANGELES

Thermal processing of dewatered sludge has been found to be the most feasible alternative for the City of Los Angeles. Such a project is compatible with applicable regulatory requirements and can be implemented within the existing treatment plant boundaries, involves minimal truck traffic, and provides for resource recovery through production of electricity and steam for use in the processing of wastewaters and sludges. A conceptual diagram of the proposed facilities is contained in Figure 1.

A mechanical composting demonstration facility will be constructed at the Terminal Island Treatment Plant. One of the two basic systems - batch feeding at wide time intervals or continuous flow fed at short time intervals - will be examined. Process selection will be coordinated with Los Angeles County Sanitation Districts to avoid duplication and to develop the widest possible range of information.

Primary sludge and waste activated sludge (WAS) would be anaerobically digested for gas recovery and volume reduction. Flexibility for separate or combined digestion would be provided. After digestion the combined sludges would be mechanically dewatered and dehydrated to about 95 percent solids. Studies indicate that dehydration of dewatered sludge can be accomplished using about 400-600 BTU/lb of water to be evaporated.

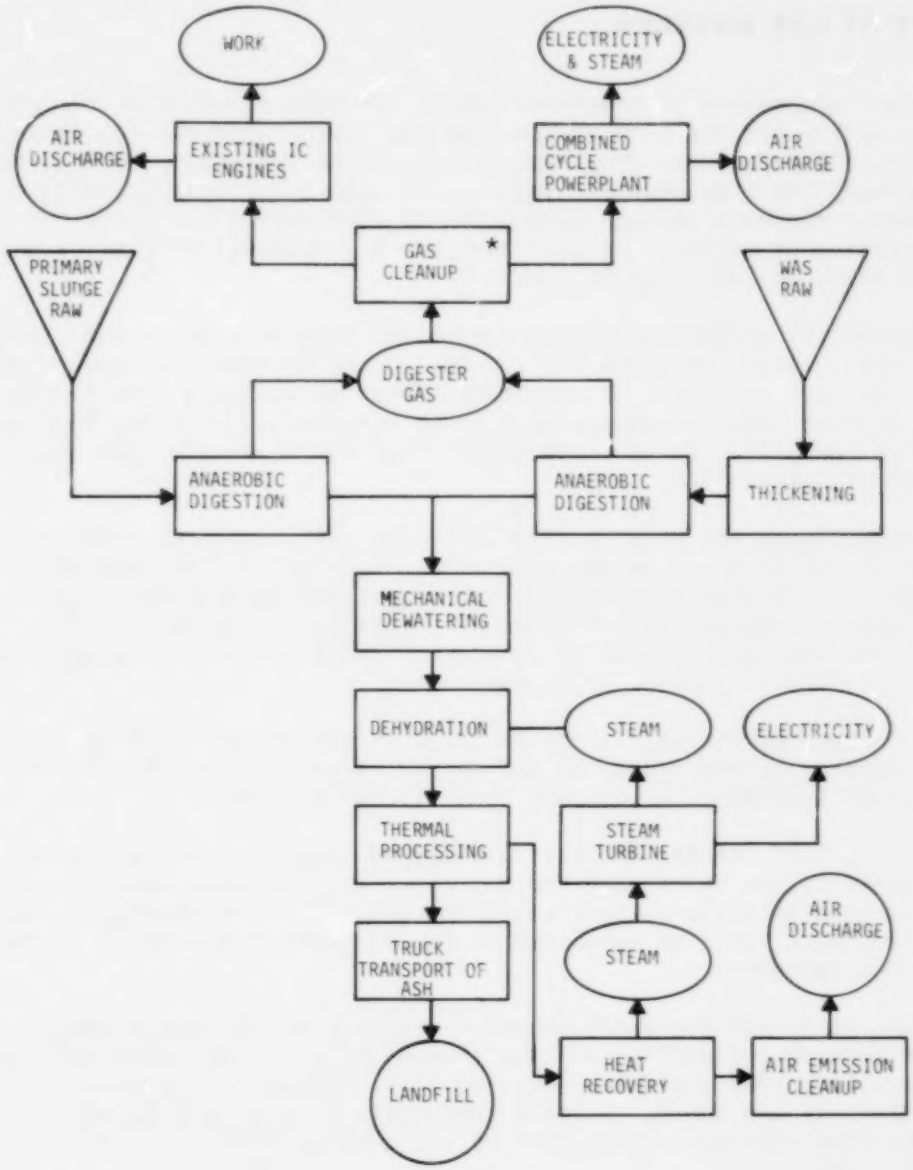
Following dehydration, sludge (perhaps in pelletized form) would be combusted for further volume reduction and energy recovery. Ash from thermal processing would be trucked to a sanitary landfill for disposal.

Offgases from thermal processing would be combusted and passed through a heat recovery system to produce steam. The resulting steam would be used in a steam turbine to generate electricity and in the dehydration process. Combusted gases would be exhausted to the atmosphere through an air emission cleanup system.

If needed to achieve a net emission increase of 150 pounds/day or less, gas from anaerobic digestion will be cleaned to remove hydrogen sulfide prior to combustion. Gas would be combusted in a combined cycle power plant to produce electricity and steam. Digester gas would also be used in existing internal combustion engines as permitted by air quality constraints and sound engineering principles.

Land availability at Hyperion Treatment Plant is a major constraint on unit process selection. Much of the existing vacant land has been reserved for expansion of wastewater processing capacity and for secondary treatment facilities. Remaining land within the treatment plant boundaries is insufficient to accommodate facilities needed to compost <u>all</u> sludge that is projected to be produced at Hyperion.

Vacant land at the western end of Los Angeles International Airport was considered for location of composting facilities below ground level (subsurface facilities should not interfere with airport operations). However, considerable uncertainty exists regarding the legally established critical



KEY

- ▽ INPUTS TO THE SYSTEM
- ▭ UNIT PROCESSES
- ⬭ USEFUL PRODUCTS
- ○ END POINTS OF THE SYSTEM

IC - INTERNAL COMBUSTION
WAS - WASTE ACTIVATED SLUDGE

*IF NEEDED TO ACHIEVE A NET EMISSION INCREASE OF 150 LBS/DAY SOX OR LESS.

NOTE: MECHANICAL COMPOSTING DEMO AT TERMINAL ISLAND TP NOT SHOWN

OVERVIEW OF FACILITIES REQUIREMENTS
CITY OF LOS ANGELES
REGIONAL SLUDGE MANAGEMENT PROGRAM
LOS ANGELES/ORANGE COUNTY METROPOLITAN AREA
FIG. 1

habitat of the El Segundo blue butterfly (Shijimiaeoides battoides allyni), an endangered species. The federally proposed critical habitat was withdrawn on March 6, 1979 and there is no precise estimate of a date for final designation of a critical habitat. Comments by the California Department of Fish and Game on the federal proposal stated that a critical habitat designation which corresponds to the present distribution of the butterfly and its larval food plants (a 50-60 acre area in the southern end of the site) should allow for the "normal needs and survival" of this relatively sedentary species if such area were properly protected. Environmental studies indicate that if the area identified for critical habitat were not used for construction of facilities and as much land as possible could be planted in buckwheat (a plant critical to the existence of the butterfly), proposed facilities should not adversely impact the butterfly in view of the fact that the other known habitat is a 2-acre site located in the middle of an oil refinery.

There are reportedly plans to construct a golf course and other recreational facilities in the area removed from the critical habitat as described by the Department of Fish and Game.

While it would appear feasible to locate composting facilities in the area without impacting the endangered species, uncertainty regarding the extent of the legally established critical habitat and the potential conflicts with land use led to the conclusion that composting of all sludge at the Hyperion Treatment Plant would not be feasible in the near term. However, close coordination between City of Los Angeles and the United States Fish and Wildlife Service regarding establishment of the critical habitat for the El Segundo blue butterfly; and close coordination between the Bureau of Engineering and Transportation Departments of the City of Los Angeles regarding plans for use of vacant lands is needed to assure that due consideration to land needs for wastewater treatment are included in decisions which will emanate from these activities.

Landfill disposal of dewatered sludge is also severely constrained. However, such constraints appear to be political in nature and have led to the conclusion that landfill disposal of sludge by the City of Los Angeles is not feasible. Concerns exist regarding the large volume of truck traffic associated with this alternative.

PHASE III OPTIONS

Phase III options have been defined for each of the LA/OMA operating agencies from information available at the time of program development. It is recognized that new information may become available during Phase II which could alter the range of options available during Phase III. The Phase III options, however, provide identification of currently indicated long range alternatives. For the City of Los Angeles, the most reasonable Phase III option appears to be expansion of the Phase II dehydration/thermal processing system.

Projected sludge loadings for Phase III options accommodate all sludge from primary treatment of 400 MGD of wastewater and secondary treatment of all primary effluent. With respect to the level of secondary treatment that may ultimately be required, the Phase III option would accommodate sludges produced by "full secondary treatment".

The Phase III option represents an upper limit for sizing of the Phase II facilities. Analysis of the Phase III option provides a description of the maximum potential environmental impact that might be realized if full secondary treatment of wastewaters or other factors necessitate expansion of Phase II facilities capacity beyond that described earlier.

LOS ANGELES COUNTY SANITATION DISTRICTS

From examination of Figure 2, it can be seen that all three of the viable alternatives are included in the proposed management program. Primary sludge and waste activated sludge (WAS) would be anaerobically digested for stabilization and gas recovery. Flexibility for separate or combined digestion would be provided. Following digestion the sludges would be mechanically dewatered for subsequent processing.

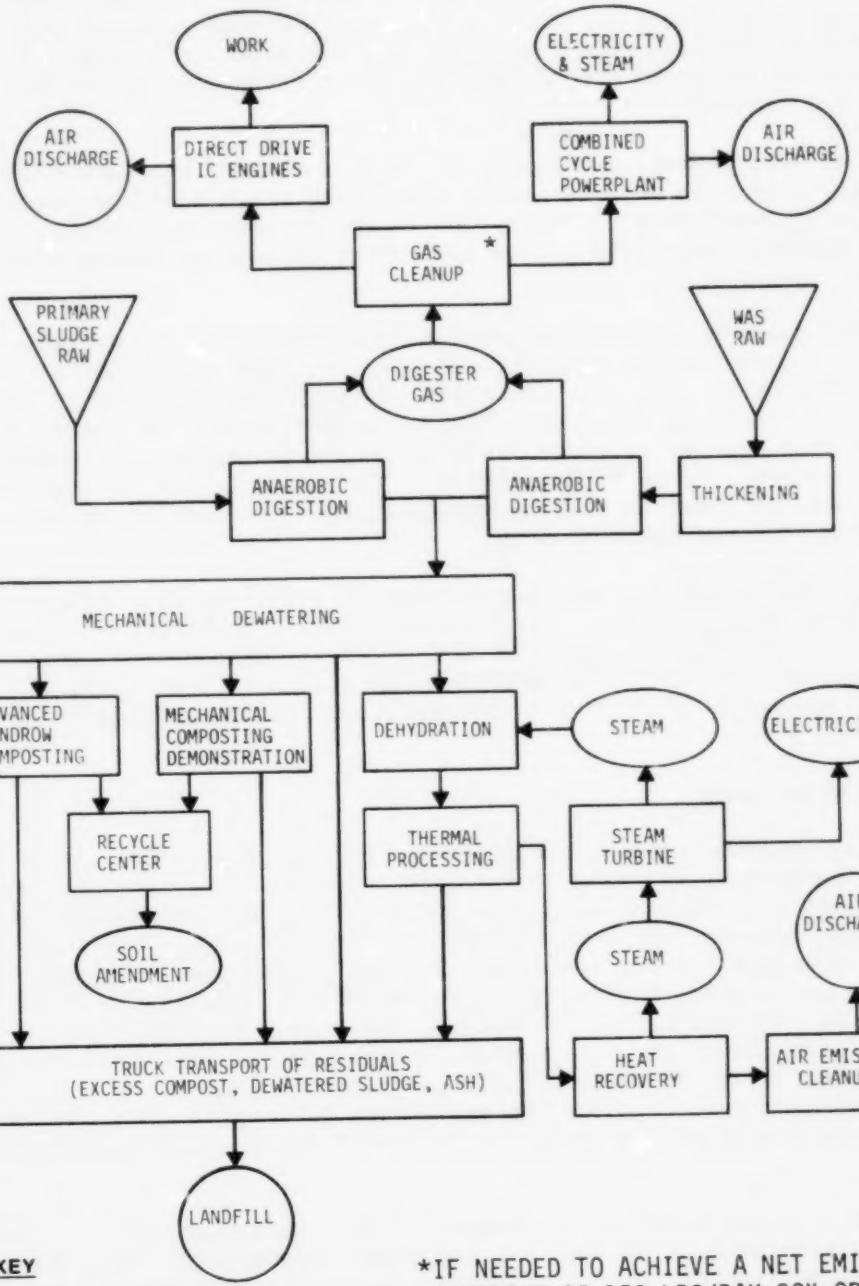
Following dewatering, three process trains will be used. A fourth - mechanical composting - will be evaluated on a demonstration basis and will not be an integral part of the operating system.

While land availability at the Joint Water Pollution Control Plant (JWPCP) is less of a constraint than at the other LA/OMA treatment plants, sufficient land does not exist for full utilization of the existing windrow composting system. Large amounts of vacant land are being used for construction of secondary treatment facilities. Additionally nuisance problems have been noted with the existing windrow system necessitating improvements if the system is to continue to be used.

The existing windrow composting system will be modified and continued in use for a portion of the sludge. Dewatered primary sludge would be used in the system. WAS could be added if field tests demonstrate that it does not adversely affect the process. Adequate mixing of dewatered sludge and recycled compost prior to placement on the compost field, forced aeration, improved turning devices, and protection from rainfall are among the possibilities to improve throughput and reduce nuisance potential. Composted sludge would be sold for recycle as a soil amendment. Excess compost would be trucked to a landfill.

Dewatered sludge (primary and WAS) would be dehydrated, (perhaps pelletized), and combusted for volume reduction and energy recovery. Studies indicate that dehydration can be accomplished using about 400-600 BTU/lb of water to be evaporated and is relatively insensitive to slight variations in dewatering performance. Ash from thermal processing would be trucked to a sanitary landfill for disposal.

The third process train will consist of truck transport of dewatered primary sludge to a sanitary landfill for disposal. This portion of the system will be used to handle the volumes of sludge not accommodated in the composting and thermal processing portions of the system.



KEY

- ▽ INPUTS TO THE SYSTEM
- ▭ UNIT PROCESSES
- ⬭ USEFUL PRODUCTS
- ○ END POINTS OF THE SYSTEM

IC - INTERNAL COMBUSTION
WAS - WASTE ACTIVATED SLUDGE

*IF NEEDED TO ACHIEVE A NET EMISSION INCREASE OF 150 LBS/DAY SOX OR LESS.

NOTE: PASTEURIZATION DEMO NOT SHOWN

OVERVIEW OF FACILITIES REQUIREMENTS
LOS ANGELES COUNTY SANITATION DISTRICTS
REGIONAL SLUDGE MANAGEMENT PROGRAM
LOS ANGELES/ORANGE COUNTY METROPOLITAN AREA
FIG. 2

If needed to achieve a net emission increase less than 150 pounds/day, gas from anaerobic digestion would be cleaned to remove hydrogen sulfide prior to combustion. Gas would be combusted in a combined cycle power plant to produce electricity and steam and in existing internal combustion engines to drive pumps and motors.

Offgases from thermal processing would be combusted and passed through a heat recovery system to produce steam. Resulting steam would be used in a steam turbine to generate electricity and in the dehydration process. Combusted gases would be exhausted to the atmosphere through an air emission cleanup system.

A modest scale mechanical composting demonstration will be conducted to establish full scale design concepts and details. One of the two basic systems - batch feeding at wide time intervals or continuous flow fed at short time intervals - will be examined. Process selection will be coordinated with the City of Los Angeles to avoid duplication and to enable development of the widest possible range of information. As inidcated earlier, this protion of the system will not be used to manage sludge on a continuing basis and will be for demonstration purposes only.

Heat pasteurization of raw sludge prior to digestion will also be undertaken on a demonstration basis. Pasteurization would be necessary if advanced windrow composting is unable to meet as-yet-to-be developed standards for pathogen destruction. The demonstration will establish performance standards and design criteria which will be available should the need arise.

PHASE III OPTIONS

Phase III options have been defined for each of the LA/OMA operating agencies from information available at the time of program development. It is recognized that new information may become available during Phase II which could alter the range of options available during Phase III. The Phase III options, however, provide identification of currently indicated long range alternatives. For the Los Angeles County Sanitation Districts, reasonable Phase III options appear to be continuation of Phase II facilities or complete reliance on the dehydration-energy recovery system or complete reliance on mechanical composting. Landfilling of dewatered sludge is not considered to be a viable long range alternative. However, an evaluation of landfill disposal will provide information that will be valuable in finalizing the sizing of Phase II facilities.

Projected sludge loadings for Phase III options accommodate all sludge from primary treatment of 330 MGD and secondary treatment of all primary effluent. With respect to the level of secondary treatment that may ultimately be required, the Phase III options would accommodate sludges produced by "full secondary" treatment.

The Phase III options represent an upper limit for sizing of Phase II facilities and provide flexibility for expansion of composting operations by shifting from the advanced windrow system to an enclosed mechanical system. Analysis of the Phase III options provides a description of the maximum potential environmental impacts that might be realized (1) if full secondary treatment or

other factors necessitate expansion of Phase II facilities beyond the loadings described earlier or (2) if, for reasons not known at this time, the sludge processing system must be shifted more heavily to composting, or to energy recovery.

ORANGE COUNTY SANITATION DISTRICTS

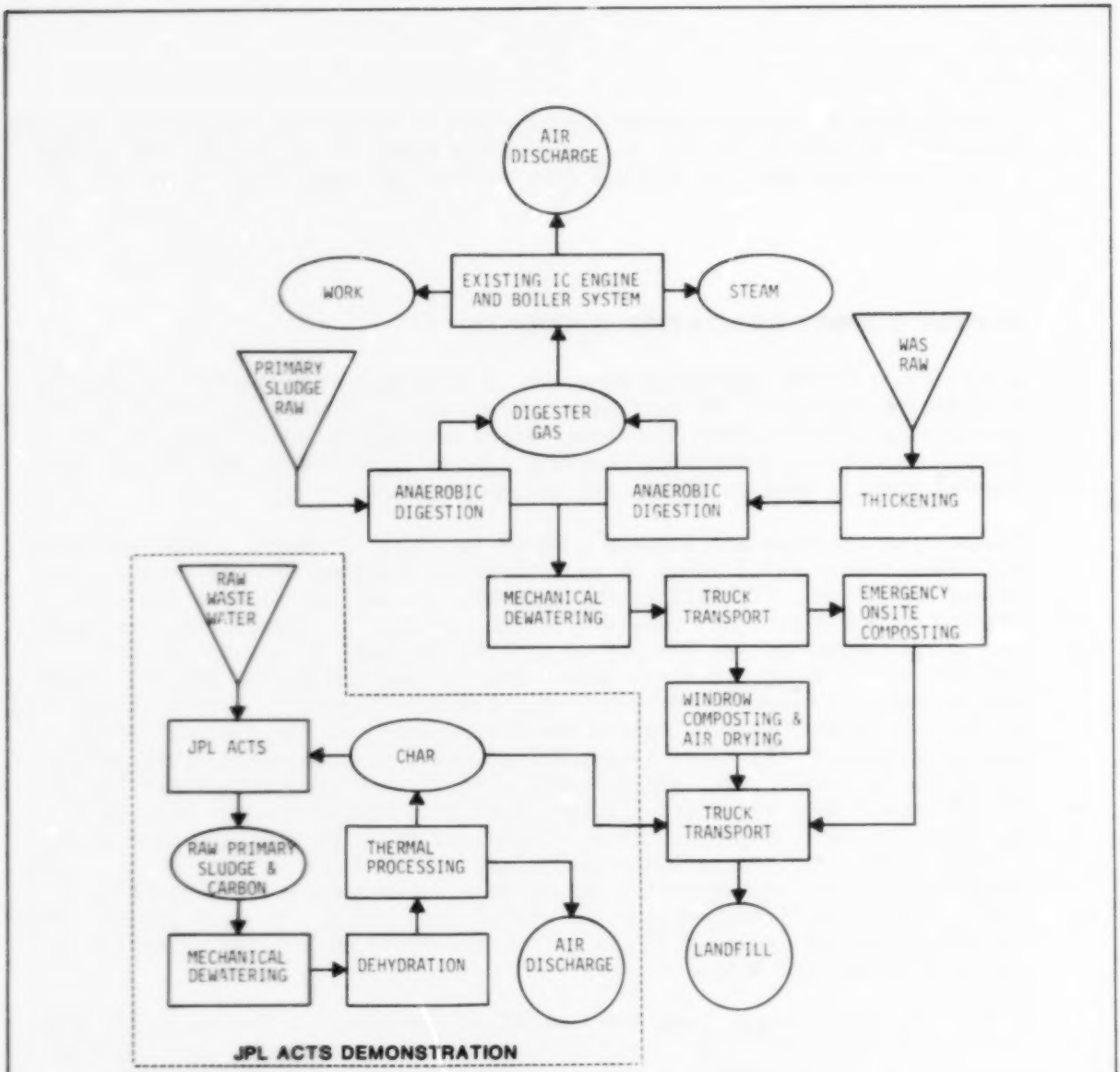
Unlike other LA/OMA operating agencies, a land based non-thermal processing alternative appears to be available. Thus, Orange County Sanitation Districts are able to utilize other technology while monitoring performance of the thermal processing and energy recovery systems operated by the City of Los Angeles and Los Angeles County Sanitation Districts.

Figure 3 is a conceptual process diagram for OCSD. Primary sludge and waste activated sludge (WAS) would be anaerobically digested for gas recovery and volume reduction. Flexibility for separate or combined sludges would be trucked to Round Canyon in eastern Orange County. At Round Canyon, a combination of composting and air drying will be employed to reduce the water content of the sludge to about 50 percent as required by the Regional Water Quality Control Board for disposal in a Class II landfill. Dried sludge will be trucked to the nearby proposed Bee Canyon landfill for disposal until metals content of the final sludge is reduced to levels which would permit recycling for public use. Additionally, if it were to occur, recycling of sludges would then be restricted to properly composted sludges because of concerns for pathogen destruction. Provision could be made to accommodate sludges from other sanitation agencies serving southern Orange County. Such agencies would be independently responsible for processing and handling of their sludges until delivery to the Round Canyon site. At such time as other technology is available, OCSD use of the site will be limited primarily to use as a backup facility.

Within the Joint Works, land availability is greatest at the treatment plant located in Huntington Beach. However, available land is not sufficient to allow for open air composting of all sludge that is to be produced at the Joint Works. Like other LA/OMA operating agencies, vacant land is being reserved for expansion of wastewater processing capacity and for installation of secondary treatment facilities.

Other than anaerobic digestion, all sludge processing will eventually be accomplished at the Huntington Beach Treatment Plant. However, provision is made for an emergency composting system at the Fountain Valley Plant to serve as backup during inclement weather and if truck transport operations are disrupted.

Both OCSD and EPA have expressed interest in continued development of the JPL-ACTS process which has been pilot tested in a 1 MGD facility at the Huntington Beach Treatment Plant. This process is a potential alternative means for secondary treatment and includes thermal processing of sludge as an integral feature of the total wastewater treatment process. However, in JPL-ACTS process, the thermal processing step is halted at the point where high



KEY

- INPUTS TO THE SYSTEM
- UNIT PROCESSES
- USEFUL PRODUCTS
- END POINTS OF THE SYSTEM

IC - INTERNAL COMBUSTION
WAS - WASTE ACTIVATED SLUDGE
JPL ACTS - ACTIVATED CARBON TREATMENT SYSTEM

OVERVIEW OF FACILITIES REQUIREMENTS
ORANGE COUNTY SANITATION DISTRICTS
REGIONAL SLUDGE MANAGEMENT PROGRAM
LOS ANGELES/ORANGE COUNTY METROPOLITAN AREA
FIG. 3

carbon content char is produced for use in the wastewater treatment process. In contrast, thermal processing systems proposed for the City of Los Angeles and Los Angeles County Sanitation Districts would carry the combustion process to near completion so that a maximum amount of energy is retrieved from the sludge prior to disposal. Since the JPL-ACTS process, if conclusively proven, could result in lower energy requirements for treatment of wastewaters, it is necessary to compare the overall system (wastewater and sludge) energy efficiency in order to compare JPL-ACTS with the proposed sludge management program. A demonstration facility is proposed to provide reliable information on a large-scale JPL-ACTS system. OCSD is pursuing funding to partially redesign and reactivate the existing 1 MGD JPL-ACTS pilot facility as the first step leading to the large scale demonstration facility. A decision to proceed with the large scale facility could be made pending conclusions from the reactivated pilot study. Since utilization of the JPL-ACTS would be demonstration in nature, provision would be made for handling all sludge at Round Canyon on a continuing basis.

PHASE III OPTIONS

Phase III options provide identification of currently indicated long-range alternatives. These have been defined from information available at the time of program development. It is recognized that new information may become available during Phase III. On a regional basis, the Phase II facilities that will be constructed by the City of Los Angeles and Los Angeles County Sanitation Districts will provide information for use by OCSD. Additionally, there may be potential for further development of the JPL-ACTS process. For the Orange County Sanitation Districts, reasonable Phase III options appear to be continuation of the Round Canyon composting/air drying facilities, or complete reliance on a thermal processing system such as dehydration/thermal processing for energy recovery or the JPL-ACTS wastewater treatment process.

For purposes of evaluation, the dehydration/thermal processing system defined for the City of Los Angeles (CLA) and L.A. County Sanitation Districts (LACSD) has been assumed. OCSD would utilize information developed by CLA and LACSD during Phase II when considering this option.

Projected sludge loadings for Phase III options accommodate all sludge loads from primary treatment of 280 MGD of wastewater and secondary treatment of all primary effluent. With respect to the level of secondary treatment that may ultimately be required, the Phase III options would accommodate sludges produced by "full secondary" treatment.

The Phase III options represent an upper limit for sizing of the Phase II facilities and provide flexibility for shifting to an energy recovery operation. Analysis of Phase III options provides a description of the maximum potential environmental impacts that might be expected (1) if full secondary treatment of other factors necessitate expansion of Phase II facilities beyond the loadings described earlier, or (2) if the sludge management program shifted to an energy recovery system.

DESCRIPTION OF ALTERNATIVE SLUDGE MANAGEMENT PROJECTS

Development of the Proposed Sludge Management Program was initiated with the analysis of the candidate systems that could be used to process, reuse and dispose of sludge. Such analysis led to the development of fundamental sludge management alternatives which encompassed the basic concepts that are available for sludge management. Twelve alternative sludge management projects were defined through analysis of various combinations of unit processes within each fundamental management alternative and systematic identification of suitable project locations.

Table 1 lists the twelve alternative projects and relates each project to a fundamental management alternative. The table shows which projects are "regional" and require the consolidation of all sludge to a single location for processing, and which projects are "individual" and can be carried out by the operating agencies acting individually.

TABLE 1

Project Number	Management Alternative Project Type	Project Name
1-R-1	Long Distance Transport Regional	Solar Drying Basins
1-R-2	Long Distance Transport Regional	DESERT Energy Project
2-R-1	Dewatering and Composting Regional	Centralized Dewatering and Composting
2-S-1	Dewatering and Composting Individual	Decentralized Dewatering and Composting
2-S-1x	Dewatering and Composting Individual-OCSD	Round Canyon Composting/ Air Drying-OCSD
3-R-1	Thermal Processing Regional	Energy Recovery from Sludge and Dairy Waste
3-S-1	Thermal Processing Individual	Energy Recovery from Sludge
3-S-2	Thermal Processing Individual	Energy Recovery from Sludge and Solid Waste
4-S-1	Disposal Individual	Deep Ocean Outfalls
4-R-1	Disposal Regional	Barge Disposal
D-S-1	Disposal Individual	Truck Dewatered Cake to Landfills
6-S-1	Baseline Individual	Baseline "No Project" Alternative

AFFECTED ENVIRONMENTS

Existence and severity of potential environmental impacts of the previously listed alternative sludge management projects depend upon the characteristics of the environment that may be affected by the proposed action. Certain environmental impacts are site specific in nature while others are of concern on a regional basis. The table below relates the alternative projects to project regions. Specific locations of sites are shown on Figure 4.

PROJECT AREAS	PROJECT NUMBERS	SITE NAMES
South Los Angeles County	2S1, 3S1, 3S2, 4S1, 4R1, DS1, 6S1	JWPCP, LAX, Hyperion Treatment Plant, Ultimate Disposal locations: Puente Hills and Lopez Canyon Landfills
Orange County	2S1, 2S1X, 3S1, 3S2, 4S1, 4R1, DS1, 6S1	OCSD #1, OCSD #2, Round Canyon Ultimate Disposal locations: Prima Deschecha, Coyote Canyon and Proposed Bee Canyon Landfills
Antelope/Victor Valley	1R1, 1R2	South Edwards Alternate Sites: Mojave, Stoddard Valley and Twenty-nine Palms Ultimate Disposal locations: on-site
Southwestern San Bernardino/Western Riverside Counties	2R1, 3R1	Fontana Ultimate Disposal location: Milliken Ave. Landfill
South San Joaquin Valley	None	None

SITE IDENTIFICATION

Site identification studies were initiated with preliminary studies leading to identification of five project areas. The regional environmental evaluation resulted in identification of parcels of land within the project areas that

were not subject to legal or regulatory environmental constraints or potential adjacent land use conflicts. Each of the project areas were examined to identify potentially suitable parcels of land classified as agriculture, military land, oil fields, quarries, and vacent lands. Lands with slope greater than 15 percent were excluded.

Environmental factors protected by Federal and State legislation and/or regulations were (1) geohydrological constraints consisting of continuity with usable groundwaters, flood plain locations, and fault hazard zones; (2) ecological constraints consisting of distribution and occurrence of rare and endangered animals, legally protected rare and endangered plants, legally established sanctuaries and preserves, rare native plants, and unique ecological communities; and (3) prime and potentially prime agricultural lands.

Potentially suitable parcels of land which survived the environmental constraint screening were evaluated in terms of potential conflicts with adjacent land uses. Remaining parcels were examined for engineering constraints and further screening with respect to land uses within one half mile and future development patterns and growth trends. Information from these studies was supplemented as necessary with site visits to identify the sites for purposes of alternatives analysis.

The specific aspects of the biophysical and socioeconomic environments that were included in the assessment of the Alternative Sludge Management Projects and the Proposed Sludge Management Program are shown in Table 2. Whether each investigation was regional and/or local in scale is also shown.

TABLE 2

FOCUS OF INVESTIGATION
ASSESSMENT OF ALTERNATIVES AND PROPOSED SLUDGE MANAGEMENT PROGRAM

AFFECTED ENVIRONMENTS (V)[1]	REGIONAL		LOCAL	
	ALT.(VI)	PROG.(VII)	ALT.(VI)	PROG.(VII)
Physical Resources				
• Geohydrology/Water Quality			2	•
• Mineral Deposits			•	
• Prime & Potentially Prime Agricultural Soils			•	
• Air Quality	3	•		
• Marine Water Quality	4	5		
Biotic Resources				
• Terrestrial Biota			•	•
• Marine Biota	•	5	•	5
Cultural Resources				
• Archaeological Sites			•	•
• Histroical Sites			•	
Community Patterns & Aesthetic Concerns				
• Land Use			6	•
• Visual Character			•	•
• Nuisances			•	•
Public Health[7]				
• Air Pollutants			•	•
• Heavy Metals			•	•
• Trace Organics			•	•
• Pathogens			•	•
Public Services & Facilities				
• Transportation	•			•
• Waste Disposal			•	•
• Wastewater Treatment	•	•		
• Water Supply	•	•		
• Energy	8	•		
Economics				
• Public Sector	•			•
• Private SEctor	•	•		
• Employment	•	•		

SOURCE: DMJM and LA/OMA Project

1. Population and Housing would not be affected.
2. Geohydrology included in Engineering Practicability; Water Quality, in Public Health (see note below).
3. Air quality included in Public Health (see note below).
4. Marine water quality included in Marine Biota and Public Health (see note below).
5. Ocean Disposal not included in Program.
6. Land use included in Visual Character and Nuisances (see note below).
7. Public health focused on potentially affected individuals (see note below).
8. Energy included in Quantitative Characteristics (see note below).

NOTE: Methodology used in the Alternatives Assessment did not permit double counting. See introduction to Chapter VI and Appendix C.

ASSESSMENT OF ALTERNATIVES

Each of the alternative sludge managemnet projects were analyzed by a team of LA/OMA Project staff and consultants. Comparative evaluation of the alternative sludge management projects was based upon consideration of:

- Environmental acceptability in terms of potential benefits and adverse impacts and the ability to mitigate the latter.
- Engineering practicability in terms of the qualitative factors of feasibility, flexibility, reliability, and occupational concerns.
- Implementation potential in terms of anticipated regulatory compatibility, practicality, and public acceptance.
- Quantitative characteristics consisting of economics, energy production and consumption, and estimates of direct mass emission rates of air pollutants.

Qualitative considerations were evaluated and ranked independently. The evaluation criteria shown in Table 3 were established to permit comparison of the inherently different considerations. Using the results of the respective evaluations, alternatives were categorized within each consideration into four broadly defined groups. A summary of the results of the evaluations of qualitative considerations is provided in graphic form in Table 4.

The major quantitative information developed during the evaluation of alternatives included economics (capital and operating costs), energy consumption and production, and air pollutant mass emission estimates. For purposes of comparison of alternatives, a system of rank ordering of economics and energy and air pollutant mass emission estimates was used. Energy factors were assumed to be represented by economic information since both costs and credits for energy consumption and production were included in the economic analysis. Additionally, effects of future energy price increases were included in the analysis of effects of inflation upon capital and operating costs.

Rankings of alternatives for each qualitative consideration were combined together with the ranking of quantitative characteristics for comparison of alternatives. From this comparison, conclusions were drawn regarding prospects for inclusion of the various alternatives in the proposed sludge management program for the Los Angeles/Orange County Metropolitan Area.

ENVIRONMENTAL ASSESSMENTS

Assessment of the alternative sludge managment projects began with identification of environmental factors that could potentially be affected by the respective alternatives. It was found that certain geographic factors (such as population and housing) would not be affected, however, other aspects of the socioeconomic environment (such as costs to the public and demands upon public services and facilities) should be examined. Other major factors were concerned with the biophysical environment and public health concerns.

TABLE 3

EVALUATION CRITERIA FOR QUALITATIVE CONSIDERATION

CATEGORY	ENGINEERING PRACTICABILITY	ENVIRONMENTAL ACCEPTABILITY	IMPLEMENTATION POTENTIAL
Excellent	Long term use in municipal wastewater treatment with good repeatable success, easily adaptable, degree of sophistication associated with primary treatment.	Considerable improvement over existing conditions	High degree of acceptability; judged with a high degree of certainty to be compatible with applicable laws and related planning; minimal time for implementation (terminates all sludge discharge to the ocean by the end of 1981).
Good	Applied in municipal wastewater treatment with mostly successful results; moderately adpatable; degree of sophistication associated with advanced primary treatment. 1/	Some improvement over existing conditions	Moderate degree of acceptablility; legal or planning compatibility dependent upon policy interpretation (waivers and exemptions not included); moderate amount of time required for implementation (5 years or less).
Neutral	Limited use in LA/OMA area but accepted practice in other areas of U.S. with good repeatable success; adaptable with some difficulty; degree of sophistication associated with the conventional activated sludge process.	Insignificant improvement or detrimental change; concurrent improvement and detrimental change of approximately the same magnitude and significance.	Indeterminate acceptablility; any incompatibility believed resolvable through further study during predesign; intermediate amount of time required for implementation (5-10 years).
Fair	Limited utilization in municipal wastewater treatment with questionable success; questionable adpatability; degree of sophistication associated with advanced treatment processes.	Unavoidable 2/ adverse change in existing conditions but without serious long-term implications.	Low degree of acceptance; formal administrative action to establish regulations, grant a waiver or exception or to change regulations is necessary to assure legal or planning compatibility; substantial amount of time required for implementation of (10-15 years).
Poor	Not utilized in municipal wastewater treatment or limited application with many demonstrable unsuccessful results; minimal adaptability; degree of sophistication associated with highly mechanized industrial processes.	Unavoidable adverse change in existing conditions with serious long-term implications.	Strong opposition. Legislative or judicial action required to change law or interpretation thereof is necessary to assure legal or planning compatibility; excessive amount of time required for implementation (more than 15 years).

1/ Solids removal (about 80%) in excess of primary treatment but less than secondary treatment through polymer addition prior to primary settling.

2/ Adverse changes that will not be mitigated with implementation of a proposed action or with continuation of existing practices mitigated.

TABLE VI-4

SUMMARY OF QUALITATIVE EVALUATIONS OF
ALTERNATIVE SLUDGE MANAGEMENT PROJECTS

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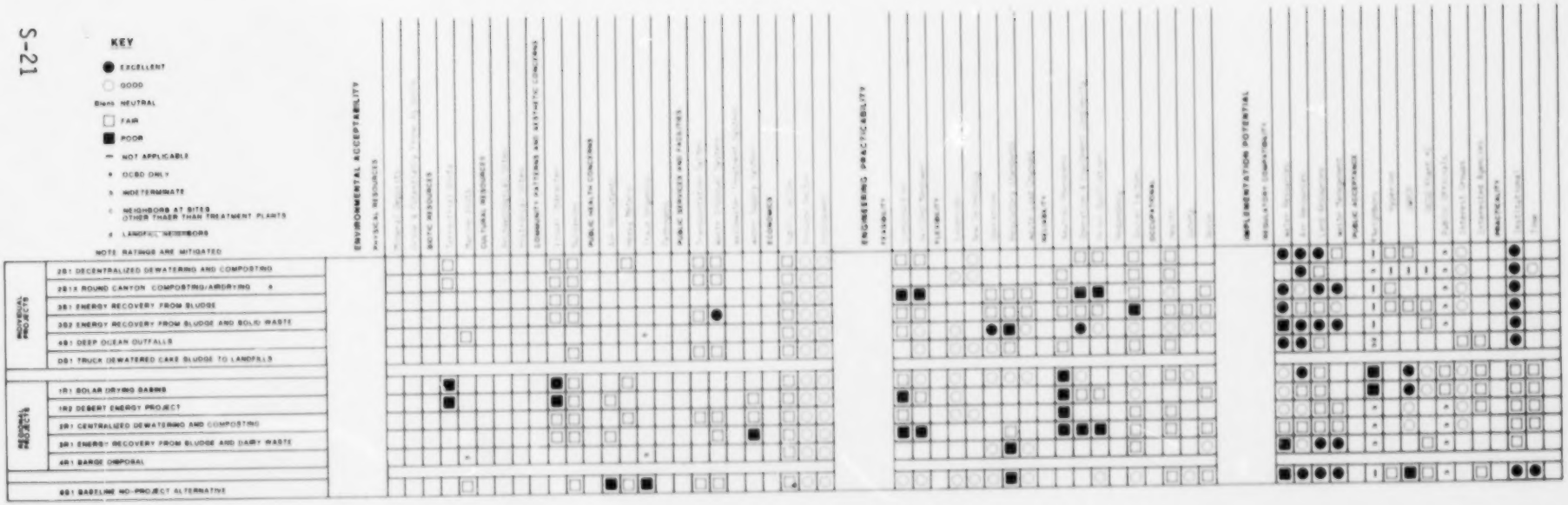

S-21

In terms of adverse impacts, none of the alternatives would be innocuous. Although the type, number, and significance of the adverse impacts would vary, problems could occur with implementation of any of the alternatives as they were defined for evaluation. The only significant, essentially unavoidable, adverse impacts involved three of the four regional alternatives. Major visual conflicts, stress to rare and endangered species, and hazards to migratory birds were anticipated with alternatives involving use of the desert -- Solar Drying Basins (1R1) and Desert Energy Project (1R2). Excessive demands on local water supply systems were projected for the alternative of Energy Recovery from Sludge and Dairy Waste (3R1). Potentially significant public health risks related to air pollutants and trace organics were identified for the Baseline No-Project Alternative (6S1).

Private economic gains and increased employment opportunities were identified for all aternatives with only slightly more benefit projected for the alternatives involving the desert. The only major benefit identified was a decrease in the volume of solid waste to be landfilled which would result from use of such solid waste in a codisposal alternative -- Energy Recovery from Sludge and Solid Waste (3S2). Alternatives involving thermal processing for energy recovery would result in total destruction of trace organics, however, adverse impacts were identified for these alternatives. It should be noted that benefits associated with recovery of energy and useful products (compost) from a renewable resource (sludge) are inherent in many of the alternatives examined.

In summary, there appears to be no overriding environmental benefits associated with implementation of any of the regional alternatives. Although adverse impacts of non-regional alternatives would not be projected to be insignificant, such impacts appeared to be generally avoidable (either through selection of options from among non-regional alternatives or application of mitigation measures) and/or not projected to be sufficient magnitude to provide the basis for selection of a regional alternative.

MAJOR FINDINGS

Impacts that were essentially the same and common to all alternatives did not provide a basis for determination of environmental acceptability. Included in this group are costs to the public sector of the economy, induced private economic benefits, and increased employment opportunities. While some differences existed among the alternatives, such differences were not of sufficient regional magnitude to provide distinction between alternatives.

Projected minimal or insignificant impacts also did not provide a basis for differentiation among alternatives. Environmental concerns in this category included effects on mineral deposits, Prime and Potentially Prime agricultural soils, historical sites, and wastewater systems.

Conclusions regarding environmental acceptability of the alternative sludge management projects were therefore based upon consideration of effects upon terrestrial and marine biotic resources*, archaeological resources, visual

*It should be noted that ocean disposal is precluded by federal and state regulations. Additionally, determination of effects upon the marine environment from deep ocean disposal requires extensive additional research.

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character and potential nuisance problems, public health, transportation systems, solid waste disposal systems, and water supply systems. A summary of the major findings related to these environmental concerns is provided for each of the alternative sludge management projects in the following sections.

Decentralized Dewatering and Composting (2S1): Although the El Segundo Blue butterfly is present on the CLA-LAX composting site, restricting development to the northern portions would probably protect the species from direct adverse impacts. However, dust, runoff, etc. during construction and operation could represent potential indirect stresses, which would probably require assessment by the federal Endangered Species Committee. Archaeological resources potentially present at the CLA-LAX site could be protected by implementation of an appropriately designed cultural resources mitigation program. Moderate visual conflicts would be experienced at Hyperion, the LAX site, and OCSD No. 1. Moderate to low visual conflicts would occur at JWPCP. Odors and dust could be potential problems at all sites. Heavy metals would be of concern with respect to public health if compost were used for an extended period of time to grow food chain crops. Disposal of composted sludge would reduce the capacity of the Lopez Canyon landfill by a fairly high percentage.

Round Canyon Composting/Air Drying (2S1-X): Implementation of this alternative would reduce the available foraging area for two pairs of Golden eagles nesting in the Cleveland National Forest by approximately 50 acres. Although this was not considered a sizable reduction in itself, cumulative impacts resulting from continued development throughout the general area could be significant. Archaeological resources present at the site could be protected by implementation of an appropriately designed cultural resources mitigation program. Although no visual conflicts were anticipated with the existing land uses in the vicinity, major problems could occur in the future if surrounding vacant land were developed for residential uses. Potential problems from odors, dust, and noise also would be minor at present but significant in the future if current development plans for the area are implemented. Containment of sludge in a landfill should reduce concerns with respect to heavy metals and trace organics.

Energy Recovery From Sludge (3S1): The major problems associated with this alternative would be moderate visual conflicts at Hyperion and OCSD No. 1, moderate to low visual conflicts at JWPCP, and some potential for odors and noise at all of the sites involved. Potential public health problems resulting from air pollutants would be greater than for the non-thermal processing alternatives. Assuming stringent particulate controls, only minimal health hazards would be associated with heavy metal emissions. Complete destruction of trace organics would occur during thermal processing.

Energy Recovery From Sludge and Solid Wastes (3S2): While visual conflicts and public health risks would be similar to 3S1, there would be somewhat more potential for problems with odors and noise. Nuisances could also include dust and insects because of the refuse that would be involved.

Deep Ocean Outfalls (4S1): Data are generally unavailable to precisely define impacts upon midwater biotic species. Lack of experience with such practices in the Southern California Bight precludes extension of conclusions derived from other operations. It should be noted, however, that this alternative would accomplish sludge disposal below the thermocline and the more productive upper ocean waters. In addition, significant historical and possibly prehistorical archaeological resources could be adversely affected during construction of the pipeline for this alternative.

Truck Dewatered Sludge to Landfill (DS1): Some potential problems with odors, noise, and dust could be experienced with implementation of this alternative, although experience with existing operations indicates that they would not be overly significant. Containment of sludge in a landfill should minimize exposure to heavy metals and trace organics. Existing congestion and vehicular conflicts on major arterials and local streets could be aggravated, while disposal of dewatered sludge would cause a fairly significant reduction in landfill capacity at Lopez Canyon.

Solar Drying Basins (1R1): Implementation of this alternative could constitute a significant threat to the Mojave ground squirrel population inhabiting the South Edwards site and probably the Mojave City alternate site. The facilities would also represent a significant hazard to migratory birds at all of the desert regional sites. Archaeological resources expected to be present at all of the sites could be protected by implementation of an appropriately designed cultural mitigation program. Significant visual conflicts and potential problems with odors would also be expected, particularly with respect to visitors to the Phacelia Wildflower Sanctuary and residents of Hi Vista. There would also be some concerns for public health with respect to heavy metals if the dried material, which could be recycled after two years storage, were used for an extended period of time to grow food chain crops.

Desert Energy Project (1R2): Hazards to migratory birds, visual conflicts, and nuisances would be somewhat more significant with this alternative than with 1R1, principally because of the thermal processing building. Effects on sensitive biotic species and protection of archaeological resources would be similar to 1R1. Although potential health concerns associated with air pollutants would be greater than with 1R1, ground level increments would be significantly less than ambient air quality standards. Similar to 3S1 and 3S2, potential public health hazards associated with heavy metals would be minimal with use of stringent particulate controls; trace organics would also be destroyed.

Centralized Dewatering and Composting (2R1): While there would be a potential for visual conflicts and nuisances with implementation of this alternative, they would probably not be overly apparent because of the industrial character of the area. However, there would be some concern for public health with respect to heavy metals if compost were used for an extended period of time to grow food chain crops. Well over half of the capacity of the Milliken landfill would be required for disposal of the composted material. In addition, freshwater requirements would represent a farily high percentage of the total supplied by the local system.

Energy Recovery From Sludge and Dairy Wastes (3R1): Similar to 2R1, minor aesthetic problems would probably be experienced with implementation of this alternative. Potential public health problems resulting from air pollutants, however, would be greater than for the non-thermal processing alternatives, though ground level increments would be significantly less than ambient air quality standards. Similar to the other thermal processing alternatives, stringent particulate controls would minimize problems with respect to heavy metals; trace organics would also be destroyed. Capacity of Milliken landfill would be required for disposal of residuals.

Barge Disposal (4R1): Information on the effects of deepwater discharge is limited. As a result, a considerable amount of background data would be required before potential impacts could be identified. Broad dispersal of sludge solids would result. However, modelling studies indicate some deposition of solids on the ocean bottom. In view of the experience with existing outfall systems, it might appear reasonable to conclude that some adverse effects would be experienced by the affected benthic community.

Baseline No-Project (6S1): A number of adverse impacts would be associated with implementation of this alternative, which would include composting, landfilling, and ocean disposal of sludge. These would include potential problems with odors, noise, and dust at the treatment plant sites, the landfills, and possibly along the transportation routes. Significant public health concerns would exist with respect to air pollutant emissions because of the use of internal combustion engines, with uptake of trace organics by marine organisms, and probably with heavy metals if compost were used over an extended period of time to grow food chain crops. Existing congestion and vehicular conflicts on major arterials and local streets could also be aggravated. The capacity of the Lopez Canyon landfill would be reduced to some extent by disposal of sludge.

Relative Merits of Alternatives

Severity of adverse impacts associated with the alternatives could in many cases be reduced through application of appropriate mitigation measures. Adverse impacts that could be mitigated to acceptable levels included (1) those involving archaeological resources at the CLA-LAX Composting site, Round Canyon site, and the desert regional sites, (2) air pollutants for all but the Baseline No-Project Alternative, (3) public health concerns associated with heavy metal emissions from the energy recovery/thermal processing alternatives, and (4) sensitive terrestrial biotics species at the CLA-LAX Composting site. Although mitigation measures for nuisance related effects would probably not totally eliminate potential impacts, the severity of such impacts should be reduced to more acceptable levels.

For purposes of comparison, alternatives were grouped according to four broadly defined groups. In general, alternatives with fewer number of adverse impacts were judged to be relatively more preferable than others, regardless of the environmental factors involved. However, impacts judged to be significantly adverse were regarded as considerably more serious than impacts judged to be simply adverse, particularly if such impacts were unavoidable. Using these

principles, the alternatives were grouped, with Group I including those alternatives involving the least number of adverse impacts. Conversely, alternatives with the greatest number of significant unavoidable adverse impacts were assigned to Group IV. Decisions regarding Group II and Group III were generally based upon the relative degree of severity between these two extremes.

- Group I

  Energy Recovery from Sludge (3S1) followed by Energy Recovery from Sludge and Solid Waste (3S2) were judged to be the most environmentally acceptable alternatives, since their implementation would not entail any significant, unavoidable adverse impacts. While there would be some concerns for visual conflicts and nuisance problems, these would be appreciably different from those associated with other alternatives judged to be less preferable.

- Group II

  Truck Dewatered Sludge to Landfills (DS1) was judged to be less preferable than the Group I alternatives, but somewhat more acceptable than the highest ranked Group III alternative. Potential nuisance problems would generally be similar to most of the other alternatives, while the potential for traffic problems and reductions in landfill capacity would be somewhat more than for all other alternatives.

- Group III

  A range of adverse impacts would be associated with the Group III alternatives, including potentially significant disturbances to sensitive biotic species and aesthetic problems (2S1-X), some concerns regarding heavy metals (2S1, 2S1-X), relatively high reductions in landfill capacity (2R1, 3R1), and high requirements for freshwater (2R1, 3R1). Although distinctions between the alternatives were difficult to make, they were generally ranked as follows: Decentralized Dewatering and Composting (2S1), Round Canyon Composting/Air Drying (2S1-X), Centralized Dewatering and Composting (2R1), and Energy Recovery from Sludge and Dairy Waste (3R1) Deep Ocean Outfalls (4S1) and Barge Disposal (4R1), were also included in Group III. However, their relative positions within the group was not determined because of the number of unknowns and uncertainties associated with their implementation.

- Group IV

  The least acceptable alternatives were judged to be in descending order Solar Drying Basins (1R1), the Desert Energy Project (1R2), and the Baseline No-Project (6S1). The desert regional alternatives would cause major visual conflicts and significant disturbances to sensitive biotic species. Public health would also be of some concern with respect to heavy metals

(1R1) and air pollutants (1R2). Potential nuisances could also constitute major annoyances in neighboring areas. Potentially significant public health risks would be associated with 6S1 - air pollutants and possible accumulation of trace organics in marine organisms. In addition, heavy metals would also be of some concern. Some problems could also be expected with respect to nuisances and vehicular congestion/conflicts.

COMPARISON OF ALTERNATIVES

For purposes of comparison, alternative sludge management projects were categorized within each of the qualitative considerations (environmental acceptability, engineering practicability, and implementation potential) according to four broadly defined groups. Group I included alternatives characterized by an overall positive combination of traits as defined by the evaluation criteria, or which did not possess a substantial number of negative traits, or which possessed few positive traits. Groups II and III included projects with intermediate overall combinations of traits. Group IV projects were considered to be least acceptable of all alternatives. Quantitative information was rank ordered and combined with the qualitative project grouping for overall comparison of alternative projects.

The rankings shown in Table 5 were used to compare alternative projects and identify potential tradeoffs associated with each of the alternatives. From this comparison, certain alternatives were found to be ill suited for inclusion in the proposed sludge management program; some alternatives were identified as having better future prospects for the basis of the proposed porgram; and certain alternatives were identified as providing a good basis for the sludge management program. The proposed sludge management program was developed from this last group of alternatives.

During the evaluation and comparison of alternative projects, care was taken to give each of the considerations equal weight. Selection of the proposed management program, however, involved assignment of relative importance to the individual considerations by the LA/OMA Project Policy Board at the time of plan selection.

The Policy Board was provided the results of the project evaluations and tradeoff identification at a two-day workshop session. Information was presented for each consideration, including the ranking of projects within each consideration. Using results of discussions at the workshop sessions, Project staff formulated recommendations regarding the goals and principles to guide preparation of the sludge management program and facilities plan and the conceptual nature of the proposed program for each operating agency.

After consideration of Project Staff recommendations, the LA/OMA Project Policy Board approved goals and principles and the conceptual nature of the management program for each operating agency. This action by the Policy Board concluded the comparative evaluation process. Subsequent efforts were directed towards preparation of facilities plans for each agency and the environmental impact statement/report required by State and Federal environmental legislation.

TABLE 5

GROUPING OF ALTERNATIVE SLUDGE MANAGEMENT PROJECTS
QUALITATIVE CONSIDERATIONS

	ENVIRONMENTAL ACCEPTABILITY	ENGINEERING PRACTICABILITY	IMPLEMENTATION POTENTIAL		QUANTITATIVE[f] ENGINEERING	
GROUP			REGULATORY COMPATIBILITY[a]	PUBLIC ACCEPTABILITY[a]	BALANCED VIEW ECONOMICS	AIR EMISSIONS
I	3S1 3S2	6S1 4R1 4S1 DS1	2S1[b] 3S1		4S1 4R1 6S1 1R2 1R1 2R1 2S1 2S1X 3S1 3R1 3S2 DS1	4S1 1R1 2S1 DS1 2S1X 2R1 4R1 3S1 1R2 3R1 3S2 6S1
II	DS1	1R1 2S1 2S1X 2R1	DS1 1R1 2S1[c] 2S1X	2S1 2S1X 3S1 DS1 2R1 3R1		
III	2S1 6S1 2S1X 2R1 3R1 4S1[e] 4R1[e]	1R2 3S1 3S2	1R2 2R1 3R1 3S2	3S2 4S1 4R1[d]		
IV	1R1 1R2	3R1	4R1	1R1 1R2 6S1		

SOURCE: DMJM, CH2M Hill, LA/OMA Project

a. The relative position of alternative projects within each group was not determined. Includes Practicality.
b. Los Angeles County Sanitation Districts and Orange County Sanitation Districts only.
c. City of Los Angeles only.
d. Although 4R1 was not discussed with the public, it probably would be similar to 4S1.
e. The relative position of 4S1 and 4R1 with respect to the other alternatives was not determined.
f. Quantitative Engineering evaluation rank ordered projects in succession only.

PROSPECTS FOR INCLUSION IN PROPOSED SLUDGE MANAGEMENT PROGRAM

Examination of the grouping of alternatives for the qualitative considerations (i.e., environment acceptability, engineering practicability, and implementation potential) shown in Table 5 indicates that no single alternative was the obvious "best alternative". The decision as to what was the best alternative(s) involved tradeoffs among the considerations.

It is possible to approach the consideration of tradeoffs in a linear fashion. For example, if with respect to qualitative considerations, engineering practicability is set aside, it is possible to identify Energy Recovery From Sludge (3S1) as sharing positive traits among the considerations of environmental acceptability, regulatory compatibility, and public acceptability. This alternative appears in the highest group for each of these considerations. Such conclusion, however, carries with it a series of tradeoffs involving lowered engineering practicability relative to the more simpler projects. It is worthwhile to note that increasing societal and environmental requirements for wastewater treatment and disposal have in the past, been met with such tradeoff.

The foregoing example can be carried through for each of the alternatives with varying points of view to arrive at different tradeoffs. It is important however, to continue quantitative characteristics with the identified qualitative tradeoffs to provide information on the economic and air emission tradeoffs involved. Continuing the above example, examination of the ranking of alternatives shown in Table 5 shows that Alternative 3S1 would involve higher costs than other alternatives as well as potentially higher air emissions.

Alternatives were grouped through consideration of tradeoffs according to prospects for inclusion in the proposed management program. The tradeoffs involved are discussed by alternative according to such groups in the following sections.

Apparent Minimal Prospects

In general, these alternatives were characterized fairly good long-term economic and engineering characteristics. However, they were either the least desirable in terms of environmental acceptability and/or implementation potential, or they offered no distinct advantages over those that were included in the Program.

Desert Regional Alternatives (1R1, 1R2)

These alternatives would have good, long-range economic feasibility and provide ling-term (40 years) facilities for sludge management. However, nuisances, visual disturbances, and ecological stresses on rare and endangered species would be significant environmental problems. In addition, an extensive archaeological mitigation program would probably be required. Without state or federal leadership, prospects for implementation appear low. A new institutional structure involving the LA/OMA operating agencies also would have to be established in order to implement the alternatives. Strong public opposition also has been voiced. Alternative Desert Energy Project (1R2) would have the additional disadvantage of introducing a significant, new source of air emissions into a clean air basin. There would be concern about the probable violation of the mercury mass emissions standard.

Fontana Regional Alternatives (2R1, 3R1)

These alternatives do not appear to offer any major advantages. Nuisances and visual disturbances were of concern with both alternatives, while Energy Recovery from Sludge (3R1) would create a large demand on the local water supply system. Land use permits probably would be difficult to obtain and it appears likely that federal and state governments would have to assume a lead role if implementation were to proceed. In addition, for Alternative 3R1, there would be no particular advantage in the use of dairy waste as a fuel supplement since sludge would still have to be dehydrated in order to support autogeneous combustion.

Barge Disposal Alternative (4R1)

Ocean disposal by barging would provide wide area dispersal of the sludge solids at moderate depth, as compared to the proposed deep ocean outfalls (Alternative 4S1), which would concentrate sludge in a limited area. Implementation potential would be low, however, due to the statutory prohibition against ocean dumping of sludge. It also would involve high air pollutant emissions, high energy consumption, and costs higher than those associated with the use of ocean outfalls. Public interest also appeared minimal regarding this alternative. However, some interest was expressed regarding ocean disposal as an interim measure. Full definition of impacts on marine resources would require additional study.

Baseline No-Project Alternative (6S1)

The Baseline essentially was an interim measure that would not constitute a long-term solution to sludge management. Other measures eventually would have been required had this alternative been selected. In addition, since it included ocean disposal, it would be difficult to continue. It also had the lowest public acceptance of all of the alternatives (although some interest was expressed regarding ocean disposal as an interim measure) and some of the more significant adverse environmental impacts.

Improved Prospects At Some Future Date

Two of the alternatives appeared to have a potential for improved future prospects, assuming that uncertainties associated with operational difficulties or adverse environmental impacts could be resolved. Both incorporated features that would add flexibility to the selected alternatives or generate additional energy.

Energy Recovery From Sludge and Solid Waste Alternative (3S2)

The main advantage of sludge/refuse co-disposal was that it would not require dehydration, which as a new technology in wastewater treatment applications, has some uncertainties associated with it. This alternative would decrease demand for landfill capacity, a beneficial impact not common to any other alternative. However, it would require an interface between the sludge management and the refuse disposal systems, and possibly be subject to operational transfer hazards and refuse collection strikes. Public objections also were expressed regarding processing of refuse at the treatment plants. Environmental problems would include visual disturbances, nuisances, and a fairly large amount of trucking. This alternative could be reevaluated as a possible future expansion of Alternative Energy Recovery From Sludge (3S2), to provide additional energy generation.

Deep Ocean Outfall Alternative (4S1)

Although prospects for implementation of this alternative appear at this time very low, it is considered possible that such potential might improve were more definitive information obtained on probable impacts on the marine environment. Areas requiring additional and/or more definitive research included deep ocean currents and hydrographics, the physical and chemical behavior of sludge in the ocean, and the distribution and abundance of marine biota. Major issues involved minimizing localized impacts, chronic sublethal effects, behavioral changes, and the time scale of the sludge induced stress on the biota and potential for bioaccumulation and attendant health concerns. Development of sufficient information on both the technical and environmental aspects of ocean disposal should result in greater understanding of the marine environment and provide flexibility for future decision making. The public expressed some interest in ocean disposal as an interim measure.

Good Prospects

Although not without problems, these alternatives appear to have the fewest number of significant adverse environmental impacts and the highest implementation potential. In most cases, the adverse impacts that were identified for these alternatives generally were of the type that could be mitigated fairly well without significantly altering the overall management system. In addition, the alternatives were relatively adaptable to change and energy efficient.

Decentralized Dewatering and Composting Alternative (2S1/2S1-X)

These alternatives appeared to be relatively uncomplicated in terms of engineering practicability, not noticeably objectionable to the public, and highly implementable, particularly at Round Canyon. In addition, a well-established market for a sludge-based soil amendment existed in the local area. Although uncertainties existed with respect to wet weather operations, studies indicated that the long-term potential was fairly good.

A number of adverse environmental impacts were identified for this alternative, but the more significant ones appeared to be mitigatable. Industrial pretreatment and pasteurization could reduce potential public health problems associated with toxicants and pathogens. Should these prove ineffective or not immediately implementable, the compost could be landfilled rather than recycled. The archaeological sites at Round Canyon were considered potentially significant cultural resources, but their protection could be assured by further investigations designed to develop an adequate mitigation program. Truck traffic, aesthetic problems, and decreased landfill capacity would remain concerns, but not more so than with any of the unselected alternatives.

Energy Recovery From Sludge Alternative (3S1)

As with all of the thermal processing alternatives, 3S1 would provide about 50 percent more energy than the non-thermal alternatives. With credits from the energy generated, costs would be about mid-range. Public acceptance appeared to be conditioned upon minimization of pollutants and nuisances. There also was some uncertainties regarding the performance of the dehydration system, the thermal processing reactor, and the air pollutant clean-up equipment. However, technical studies indicated good long-term potential for successful operation.

Although this alternative had the least number of adverse environmental impacts air pollutant emissions were among the highest of all alternatives. However, implementation of best available control technology and coordination of trade-off strategies with air quality management planning would provide a means to reduce them to within allowable limits. Aesthetic problems would remain a concern, but not significantly more so than with any of the other alternatives.

Truck Dewatered Cake to Landfill (DS1)

Landfill disposal represents the most desirable alternative from a strictly technological point of view because it was the least complex. It also would be easily implementable, providing permits were obtained in a timely manner. Potential toxicants and pathogens also could be effectively controlled through containment. In general, public acceptance appeared to be somewhat neutral, or indeterminate although an interest in resource recovery rather than disposal had been clearly indicated.

Adverse environmental impacts associated with this alternative were essentially unmitigatable. These included a significant demand on landfill capacity, a large amount of truck traffic, and a fair amount of nuisances. The alternative also had relatively poor long-range economic feasibility, though there would be good future potential for electrical credits from enhanced landfill gas production. It also would be dependent on the refuse management system and subject to some operational difficulties during wet weather. Extensive gas collection and odor control systems also might be required.

Conclusions

Based upon the relative advantages and disadvantages associated with each alternative and their relative overall desirability, it was concluded that:

- Decentralized Dewatering and Composting (2S1), Energy Recovery from Sludge (3S1), and Truck Dewatered Cake to Landfill (DS1), would provide the best long-term prospects for sludge management programs.

- Energy Recovery from Sludge and Solid Waste (3S2) could, from a technical point of view, be implemented at some future date as an expansion of 3S1.

- Deep Ocean Outfalls (4S1) appeared to offer better prospects than Barge Disposal (4R1), although additional study would be required before a definitive conclusion could be reached regarding either option.

- Solar Drying Basins (1R1), Desert Energy Project (1R2), Centralized Dewatering and Composting (2R1), and Energy Recovery from Sludge and Dairy Wastes (3R1) appeared to have poorest prospects for management programs.

ASSESSMENT OF PROPOSED SLUDGE MANAGEMENT PROGRAM

Selection of alternatives for the proposed management program precluded a number of significant adverse environmental impacts. Significant adverse impacts precluded in this manner were (1) those involving sensitive biotic species at the CLA-LAX Composting site and the desert regional sites, (2) marine biotic effects including bioaccumulation of trace organics of ocean disposal, (3) potentially significant public health concerns associated with trace organics in seafood, and (4) excessing demands on small local water supply systems.

Beneficial impacts are expected to be derived from the proposed program. Principal benefit would be production of energy from a renewable resource to supply energy demands for treatment of wastewaters. Other benefits include production of composted sludge for use as an organic soil amendment, destruction of trace organics with thermal processing, as well as induced private economic gains and increased construction employment opportunities.

Where adverse impacts were anticipated during the formulation of the proposed sludge management program, measures designed to reduce the severity or entirely eliminate such impacts were included as integral parts of the design, construction, and/or operation of facilities. The assessment has identified additional mitigation measures which can be considered for incorporation in the proposed program, however, commitment to implementation of these additional mitigation measures has not yet been made.

CITY OF LOS ANGELES

The Phase II Facilities and the Phase III Option proposed for the City of Los Angeles would both involve the thermal processing of sludge from the Hyperion treatment plant and disposal of the residual ash/char in a landfill. The designated disposal site is the Lopez Canyon Class II sanitary landfill. Either the BKK or the Calabasas Class I sanitary landfills would be used, however, if the ash/char were to be classified as Group I wastes.

A summary of the environmental assessment of the program proposed for the City of Los Angeles is provided in Table 6. The assessment did not include consideration of mineral deposits, Prime and Potentially Prime agricultural soil, terrestrial biota (including rare or endangered species), and historical resources since these factors are not present at the sites involved in the proposed program. Also, land use was not included in the assessment since use of existing facilities was determined to be compatible with applicable General Plans. It should be noted that the information provided in Table 6 refers principally to Phase II of the program.

Unavoidable adverse impacts associated with the program include visual conflicts that may be associated with the proposed facilities and public sector costs for construction and operation of facilities.

The only potential adverse impacts that could constitute preclusion of future beneficial uses would be those associated with visual character and occasional

TABLE 6

SUMMARY OF ENVIRONMENTAL ASSESSMENT[1]
CITY OF LOS ANGELES

ENVIRONMENTAL CONSIDERATION	IMPACTS			MITIGATION MEASURES[2]			UNAVOIDABLE[2] ADVERSE IMPACTS	SHORT TERM VS LONG TERM	IRREVERSIBLE COMMITTMENT OF RESOURCES
	Neutral	Beneficial	Adverse	Total in Plan	Partial in Plan	Avail-able	Mitigation Not Available		
Geohyd & Water Qual[3]	X			X					
Air Quality[4]		○	○		X	X			
Archaeological Sites	X								
Visual Character			⊖			X	X	⊖	
Nuisances			○		X	X		○	
Air Pollutants			○		X	X			
Heavy Metals			○		X	X			
Trace Organics	X			X					
Pathogens	X			X					
Transportation			○		X	X			
Waste Disposal	X								
Wastewater Treatment	X								
Water Supply[5]	X			X					
Energy[6]		●							
Public Sector			●			X	X		●
Private Sector		⊖							
Employment		⊖							

SOURCE: DMJM, LA/OMA Project

1. Includes Phase II Facilities only. Phase III Option not included.
2. Various aspects of an impact can be in more than one category.
3. Seismic events only. Water Quality would not be affected during normal operations.
4. Compared to 1978 Base conditions, reductions in NOx and HC projected; increases in CO, TSP, and SOx projected.
5. Use of effluent reduces freshwater requirement.
6. Net production of energy

KEY
○ SLIGHT
⊖ MODERATE
● MAJOR

nuisances. Enhancement of an industrial character and intensification of the visual conflicts currently existing in the Hyperion area could be emotionally disturbing when viewed from the residential neighborhood on the eastern perimeter of the treatment plant. Although long term public health effects would not be significant but are discussed below to document this conclusion.

Projected reductions in emissions of hydrocarbons and oxides of nitrogen, as well as reduced demand on electrical generating plants, should provide an overall benefit to air quality. Mitigation measures should achieve a net emission increase of less than 150 pounds per day of sulfur dioxide. Emissions from the proposed facilities would utilize a portion of the allowable emissions identified by the Air Quality Management Plan for the South Coast Air Basin.

Potential long term health implications associated with air pollutants should not be significant if ambient air quality standards are used as a measure. Health effects of small increases in ambient air pollutant concentrations are, however, difficult to assess. Rigorous information on the effect of low levels of air pollution is generally lacking. There may be no threshold below which some effect cannot be measured. Thus, while nonsensitive persons would be expected to experience minimal adverse impacts, there may be some adverse health effects in sensitive individuals from long-term exposure to low levels (i.e. lower than ambient air quality standards) of these pollutants. On a practical basis, it is likely that at very low concentrations, the effects become minor or blend into the background of other induced stresses (Ref. 1).

On the basis of the "acceptable daily intake" for cadmium recommended by the World Health Organization, public health implications associated with cadmium should not be significant. However, use of the Kjellstrom model (which is based upon a no threshold premise) (Ref. 2) indicates a small increase in risk. These differences in scientific opinion and lack of data on nonoccupational exposure complicates the assessment of public health effects of small increases in metal intake. Whether the risk calculated by the Kjellstrom model would be significant depends in large measure on the validity and sensitivity of the Kjellstrom model applied to relatively low dose levels. Ryan et-al (Ref. 3) have commented that the status of the Kjellstrom model is such that "it is premature to base regulatory decisions on its implications". Particulate emission control systems could be used to ensure minimal release of heavy metals into the air environment and to mitigate against uncertainties in the analyses (Ref. 4). If particular attention is given to maximizing efficient capture of submicron particles, it appears possible that effects of cadmium intake projected by the Kjellstrom model would not be significant.

Public health implications associated with trace organics would not be significant, since conditions of temperature, detention time, and turbulence during thermal processing would be sufficient to achieve essentially complete destruction of trace organics. The proposed project would provide for elimination over time of public health implications of trace organics in sludge discharges to the ocean.

Pathogens would be destroyed during thermal processing and not pose significant health implications.

The only adverse impacts that would constitute an irreversible commitment of resources would be those associated with public expenditures and the use of nonrenewable resources. Although some economic commitment would be required to implement any sludge management program, the costs are worth noting. The following nonrenewable resources would be consumed by the proposed program for the City of Los Angeles: Isopar for dehydration, polymers for mechanical dewatering, lime in the flue gas desulfurization system, and ammonia for NO_x control.

It should be noted that operation of the facilities would result in the net production of energy, which would be obtained from a renewable resource. In addition, a portion of the sludge would be recycled.

Implementation of the Proposed Sludge Management Program for the City of Los Angeles would not cause any significant growth-inducing impacts. The Program would not provide any additional wastewater treatment capacity, but rather provide additional methods for treating the residues resulting from wastewater treatment for which capacity will already have been determined and provided.

The only other growth-inducing potential of the Program would be immigration of program-related employees and their families, and immigration of population to accept employment in the service and retail sectors. Because most, if not all, construction labor requirements are expected to be met by local labor pools, and immigration of service employment is expected to be negligible, virtually no growth is expected from construction activity. Maximum employment during operations would be relatively insignificant. Therefore, virtually no growth in population or infrastructure is expected to result, either from operations or construction of the program.

LOS ANGELES COUNTY SANITATION DISTRICTS

The Phase II Facilities proposed for the Los Angeles County Sanitation Districts will involve three process trains (1) thermal processing, (2) windrow composting, and (3) trucking dewatered sludge to a landfill. The Phase III Options will include two process trains (1) thermal processing and (2) enclosed mechanical composting. Although trucking dewatered sludge to a landfill was not identified as a definite Phase III option, it was included in the assessment to give an indication of the impacts that would occur were it to become a viable option at some point in the future. The designated disposal site is the Puente Hills Class II sanitary landfill. Either the BKK or the Calabasas Class I sanitary landfills would be used, however, if the ash/char were to be classified as Group I wastes.

A summary of the environmental assessment of the program proposed for the Los Angeles County Sanitation Districts is provided in Table 7. The assessment did not include consideration of mineral deposits, Prime and Potentially Prime agricultural soil, and historical resources since these factors are not present at the sites involved in the proposed program. Also, land use was not included in the assessment since use of existing facilities was determined to be compatible with applicable General Plans. It should be noted that the information provided in Table 7 refers principally to Phase II of the program.

TABLE 7

SUMMARY OF ENVIRONMENTAL ASSESSMENT[1]
LOS ANGELES COUNTY SANITATION DISTRICTS

ENVIRONMENTAL CONSIDERATION	IMPACTS			MITIGATION MEASURES[2]			UNAVOIDABLE[2] ADVERSE IMPACTS	SHORT TERM VS LONG TERM	IRREVERSIBLE COMMITTMENT OF RESOURCES
	Neutral	Beneficial	Adverse	Total in Plan	Partial in Plan	Available	Mitigation Not Available		
Geohyd & Water Qual[3]	X			X					
Air Quality[4]		○	○		X	X			
Terrestrial Biota	X			X					
Archaeological Sites	X			X					
Visual Character			○			X	X	○	
Nuisances			⊖		X	X		⊖	
Air Pollutants			○		X	X			
Heavy Metals			⊖		X	X			
Trace Organics	X				X				
Pathogens[5]	X				X	X			
Transportation			○		X	X			
Waste Disposal	X								
Wastewater Treatment	X								
Water Supply[6]	X			X					
Energy[7]		●							
Public Sector			●			X	X		●
Private Sector		⊖							
Employment		⊖							

SOURCE: DMJM, LA/OMA Project

1. Includes Phase II Facilities only. Phase III Options and demonstration projects not included.
2. Various aspects of an impact can be in more than one category.
3. Seismic events only. Water quality would not be affected during normal operations.
4. Compared to 1978 Base conditions, reductions in NOx and HC projected; increases in Co, TSP, and SOx projected.
5. Mitigation would be necessary only if compost quality criteria were not achieved.
6. Use of effluent reduces freshwater requirement.
7. Net production of energy.

KEY
○ SLIGHT
⊖ MODERATE
● MAJOR

Unavoidable adverse impacts associated with the proposed program include visual conflicts that may be associated with proposed facilities and public sector costs of construction and operation of facilities.

Potential adverse impacts that could constitute a preclusion of future beneficial uses would be associated with visual character and intermittent nuisances. Increasing the dominance of an industrial character in the vicinity of the Joint Water Pollution Control Plant could be emotionally disturbing when viewed from nearby residential neighborhoods. Although long-term public health effects would not be significant but are discussed below to document this conclusion.

Projected reductions in emissions of hydrocarbons and oxides of nitrogen and reduced demand on electrical utility generating plants should provide an overall benefit to air quality. Mitigation measures should achieve a new emission increase of less than 150 lb/day of sulfur dioxide. Emissions from the proposed project would utilize a portion of the allowable emissions identified by the Air Quality Management Plan for the South Coast Air Basin.

Potential long term health implications associated with air pollutants should not be significant if ambient air quality standards are used as a measure. Health effects of small increases in ambient air pollutant concentrations are, however, difficult to assess. Rigorous information on the effect of low levels of air pollution is generally lacking. There may be no threshold below which some effect cannot be measured. Thus, while nonsensitive persons would be expected to experience minimal adverse impacts, there may be some adverse health effects in sensitive individuals from long term exposure to low levels (i.e. lower than ambient air quality standards) of these pollutants. On a practical basis, it is likely that at very low concentrations, the effects become minor or blend into the background of other induced stresses (Ref. 1).

On the basis of the "acceptable daily intake" for cadmium recommended by the World Health Organization, public health implications associated with cadmium should not be significant. However, use of the Kjellstrom model (which is based upon a no threshold premise) (Ref. 2) indicates a small increase in risk. These differences in scientific opinion and lack of data on nonoccupational exposure complicates the assessment of public health effects of small increases in metal intake. Whether the risk calculated by the Kjellstrom model would be significant depends in large measure on the validity and sensitivity of the Kjellstrom model applied to relatively low dose levels. Ryan et-al (Ref. 3) have commented that the status of the Kjellstrom model is such that "it is premature to base regulatory decisions on its implications". Particulate emission control systems could be used to ensure minimal release of heavy metals into the air environment and to mitigate against uncertainties in the analyses (Ref. 4) If particular attention is given to maximizing efficient capture of submicron particles, it appears possible that effects of cadmium intake projected by the Kjellstrom model would not be significant.

Public health implications associated with long term use of sludge based products for raising garden produce appear potentially significant. Aggressive industrial pretreatment programs and labeling instructions against such use should substantially reduce the significance of such implications. There are indications that pretreatment programs to remove cadmium could achieve intake levels below the "acceptable daily intake" recommended by the World Health

Organization. The Kjellstrom model would indicate a minimal risk. Labeling against use of sludge based products for such use could lessen risks. However, potential exists for individuals to ignore such labels.

Use of sludge based products to grow non-foodchain crops would have no significant health implications, however, potential exists for conversion of such land to use for food chain crops. Implications of this possibility are difficult to assess. For effects to be of serious concern, sludge application would have to occur for a long time period as would use of the land for food chain crops.

Public health implications associated with trace organics would not be significant since conditions of temperature, detention time, and turbulence during thermal processing would be sufficient to achieve essentially complete destruction of trace organics. Trace organics in composted sludge are not indicated to be actively taken up by plants. Therefore, trace amounts applied with the compost are expected to remain in the soil. The proposed program would provide for elimination over time of public health implications of trace organics in sludge discharges to the ocean. There may however, be an intervening time period when such risks may be increased as a result of re-emergence of contaminated sediments. Such occurrence would be temporary and diminish as the contaminated sediments were moved offshore into the deep basins.

Pathogens would be destroyed during thermal processing and not pose significant helath implications. Assuming quality control criteria are achieved by the composting process, minimal public health risk should ensue.

Landfilling of dewatered sludge should have no long term significant public health implications. Some short term implications may be associated with accidents involving trucks hauling dewatered sludge.

The only adverse impacts that would constitute an irreversible commitment of resources would be those associated with public expenditures and the use of nonrenewable resources. Although some economic commitment would be required to implement any sludge management program, the costs are worth noting. The following nonrenewable resources would be consumed by the proposed program for the Los Angeles County Sanitation Districts: Isopar for dehydration, polymers for mechanical dewatering, lime in the flue gas desulfurization system, and ammonia for NO_x control.

It should be noted that operation of the facilities would result in the net production of energy, which would be obtained from renewable resource. In addition, a portion of the sludge would be recycled.

Implementation of the Proposed Sludge Management Program for the Los Angeles County Sanitation Districts would not cause any significant growth-inducing impacts. The program would not provide any additional wastewater treatment capacity, but rather provide additional methods for treating the residues resulting from wastewater treatment for which capacity will already have been determined and provided.

The only other growth-inducing potential of the program would be immigration of program-related employees and their families, and immigration of population

to accept employment in the service and retail sectors. Because most, if not all, construction labor requirements are expected to be met by local labor pools, and immigration of service employment is expected to be negligible, virtually no growth is expected from construction activity. Maximum employment during operations would be relatively insignificant. Therefore, virtually no growth in population or infrastructure is expected to result, either from operations or construction of the program.

ORANGE COUNTY SANITATION DISTRICTS

The Phase II facilities proposed for the Orange County Sanitation Districts will involve composting/air drying of dewatered sludge at a site near Round Canyon. Phase III options include (1) a continuation of the Round Canyon operation and (2) energy recovery. Dried sludge produced in both phases and surplus ash/char that would be produced by the energy recovery option would be disposed in the proposed Bee Canyon Class II landfill.

A summary of the environmental assessment of the program proposed for the Orange County Sanitation Districts is provided in Table 8. The assessment did not include consideration of Prime and Potentially Prime agricultural soils and historical resources since these factors are not present at the sites involved in the proposed sludge management program. Although the Round Canyon site is in an area that has potential for mineral extraction, mineral deposits were not included since it was determined during the assessment of alternatives that such impacts would be insignificant. It should be noted that information provided in Table 8 refers principally to Phase II of the program.

Unavoidable adverse impacts associated with the proposed program include loss of about 50 acres of potential foraging habitat for the two pair of Golden eagles (Aquila Chrysaetos) nesting in the Cleveland National Forest. Because of continued development throughout the general area such impact could become important in the future in terms of cumulative impacts. While proposed facilities would not have a significant adverse on the existing Canyon area as provided by the currently applicable General Plans, future visual conflicts could be perceived as emotionally disturbing by inhabitants of such future development. Public costs of construction and operation of proposed facilities would also be considered as an unavoidable adverse impact.

Potential adverse impacts that could constitute a preclusion of future beneficial uses would be associated with terrestrial biota (loss of 50 acrea of foraging habit for the two pairs of Golden eatles nesting in Cleveland and National Forest), and visual character impacts and potential nuisances that could be expected at the Round Canyon site if development occurs in the Round Canyon area as provided by currently applicable General Plans. Potential long-term public health effects would not be significant but are discussed below to document this conclusion.

Net emission increases projected for the proposed project would be largely from mobile sources. Such emissions would utilize a portion of the allowable emissions identified by the Air Quality Management Plan for the South Coast Air Basin.

TABLE 8

SUMMARY OF ENVIRONMENTAL ASSESSMENT[1]
ORANGE COUNTY SANITATION DISTRICTS

ENVIRONMENTAL CONSIDERATION	IMPACTS			MITIGATION MEASURES[2]			UNAVOIDABLE[2] ADVERSE IMPACTS	SHORT TERM VS LONG TERM	IRREVERSIBLE COMMITTMENT OF RESOURCES
	Neutral	Beneficial	Adverse	Total in Plan	Partial in Plan	Available	Mitigation Not Available		
Geohyd & Water Qual[3]	X			X					
Air Quality			○		X	X			
Terrestrial Biota			⊖				X	⊖	⊖
Archaeological Sites	X			X					
Land Use			*			X			
Visual Character			*			X	X	*	*
Nuisances			*		X	X		*	
Air Pollutants			○		X	X			
Heavy Metals[4]			○		X	X			
Trace Organics	X			X					
Pathogens	X			X					
Transportation			⊖		X	X			
Waste Disposal	X								
Wastewater Treatment	X								
Water Supply[5]	X			X					
Energy[6]		⊖			X				
Public Sector			●			X	X		●
Private Sector		⊖							
Employment		⊖							

SOURCE: OMJM, LA/OMA Project

1. Includes Phase II Facilities only. Phase III Options and Demonstration Project not included.
2. Various aspects of an impact can be in more than one category.
3. Seismic events only. Water quality would not be affected during normal operations.
4. Assumes Phase III full energy recovery. Negligible effects from JPL-ACTS.
5. Use of effluent reduces freshwater requirement.
6. Net production of energy.
7. Note: Currently no major impact. Realization of future development plans will, however, result in major adverse impact.

KEY
○ SLIGHT
⊖ MODERATE
● MAJOR

Potential long term health implications associated with air pollutants should not be significant if ambient air quality standards are used as a measure. Health effects of small increases in ambient air pollutant concentrations are, however, difficult to assess. Rigorous information on the effect of low levels of air pollution is generally lacking. There may be no threshold below which some effect cannot be measured. Thus, while nonsensitive persons would be expected to experience minimal adverse impacts, there may be some adverse health effects in sensitive individuals from long term exposure to low levels (i.e. lower than ambient air quality st dards) of these pollutants. On a practical basis, it is likely that at very low concentrations, the effects become minor or blend into the background of other induced stresses (Ref. 1).

On the basis of the "acceptable daily intake" for cadmium recommended by the World Health Organization, public health implications associated with cadmium should not be significant. However, use of the Kjellstrom model (which is based upon a no threshold premise) (Ref. 2) indicates a small increase in risk. These differences in scientific opinion and lack of data on nonoccupational exposure complicates the assessment of public health effects of small increases in metal intake. Whether the risk calculated by the Kjellstrom model would be significant depends in large measure on the validity and sensitivity of the Kjellstrom model applied to relatively low dose levels. Ryan et-al (Ref. 3) have commented that the status of the Kjellstrom model is such that "it is premature to base regulatory decisions on its implications". Particulate emission control systems could be used to ensure minimal release of heavy metals into the air environment and to mitigate against uncertainties in the analyses (Ref. 4). If particular attention is given to maximizing efficient capture of submicron particles, it appears possible that effects of cadmium intake projected by the Kjellstrom model would not be significant.

Public health implications associated with heavy metals and trace organics at the Round Canyon facilities should be minimal since all processed sludge would be landfilled until heavy metal concentrations in the processed sludge reach acceptable levels. Thermal processing should destroy essentially all trace organics and pathogens and therefore pose no significant health threat from these sources. The project would eliminate health implications associated with trace organics in sludge discharges to the ocean.

Except for potential wind blown dust, health implications associated with pathogens at the Round Canyon site should not be significant. Health implications arising from wind blown dust need not be significant if adequate dust control measures are designed into the facilities and operating procedures.

The adverse impacts that would constitute an irreversible commitment of resources would be those associated with (1) loss of the 50 acres of foraging habitat for the two parirs of Golden eagles (Aquila Chrysaetos), (2) potential loss of an emotionally satisfying visual environment if land use conflicts were to result from realization of future development plans, and (3) public expenditures.

It should be noted that operation of the facilities would result in the production of energy, which would be obtained from a renewable resource.

Implementation of the Proposed Sludge Management Program for the Orange County

Sanitation Districts would not cause any significant growth-inducing impacts. The program would not provide any additional wastewater treatment capacity, but rather provide additional methods for treating the residues resulting from wastewater treatment for which capacity will already have been determined and provided.

The only other growth-inducing potential of the program would be immigration of direct project employees and their families, and immigration of population to accept employment in the service and retail sectors. Because most, if not all, construction labor requirements are expected to be met by local labor pools, and immigration of service employment is expected to be negligible, virtually no growth is expected from construction activity. Maximum employment during operations would be relatively insignificant. Therefore, virtually no growth in population or infrastructure is expected to result, either from operations or construction of the program.